WHAT IS CLAIMED IS:

1. A method for chemically decontaminating radioactive material, the method comprising:

reducing-dissolving step for setting surface of radioactive material in contact with reducing decontamination liquid including mono-carboxylic acid and di-carboxylic acid as dissolvent; and

oxidizing-dissolving step for setting the surface of the radioactive material in contact with oxidizing decontamination liquid including oxidizer.

2. The method according to Claim 1, wherein:

the radioactive material includes stainless steel; and

the reducing-dissolving step includes lowering potential of the radioactive material to a corrosion region of stainless steel.

3. The method according to Claim 1, comprising a plurality of repeated pairs of steps, each pair including the reducing-dissolving step and the oxidizing-dissolving step.

4. The method according to Claim 1, wherein: the mono-carboxylic acid includes formic acid, and the

di-carboxylic acid includes oxalic acid.

5. The method according to Claim 1, wherein mole fraction of the formic acid in the decontamination liquid is 0.9 or more.

6. The method according to Claim 1, wherein the oxidizer includes at least one selected from a group of ozone, permanganic acid and permanganate.

7. The method according to Claim 1, further comprising separating and removing Fe^{2+} ions and Fe^{3+} ions, which have eluted into the reducing decontamination liquid, by cation resins.

8. The method according to Claim 1, further comprising:

decomposing the mono-carboxylic acid by hydrogen peroxide solution; and

decomposing the di-carboxylic acid into carbon dioxide and water by the oxidizing decontamination liquid.

9. A system for chemically decontaminating radioactive material which forms a passage for liquid to flow through, the system comprising:

a circulation loop connected to the passage for circulating the decontamination liquid, the circulation loop having:

a decontamination agent feeder for feeding mono-carboxylic acid and di-carboxylic to the decontamination liquid;

a hydrogen peroxide feeder for feeding hydrogen peroxide to the decontamination liquid;

an ion exchanger for separating and removing metal ions in the decontamination liquid; and

an ozonizer for injecting ozone into the decontamination liquid.

10. A system for chemically decontaminating radioactive material, the system comprising:

a decontamination tank for containing radioactive material and decontamination liquid;

a direct current power source for providing potential between the radioactive material and an anode; and

a circulation loop connected to the tank for circulating the decontamination liquid, the circulation loop having:

a decontamination agent feeder for feeding mono-carboxylic acid and di-carboxylic acid into the decontamination liquid;

a hydrogen peroxide feeder for feeding hydrogen peroxide into the decontamination liquid;

an ion exchanger for separating and removing metal ions in the decontamination liquid; and

an ozonizer for injecting ozone into the decontamination liquid.

11. The system according to Claim 10, further comprising:

an electric insulating plate disposed in the decontamination tank; and

a support for supporting the radioactive material, the support being disposed on the electric insulating plate and being made from corrosion resistant metal.